

THE DEVELOPMENT OF NEUROLOGICAL SURGERY IN NEW YORK CITY DURING THE PAST TWENTY-FIVE YEARS*

With Remarks on Advances due to Experiences in the First World War

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IN our city and country, neurological surgery began to be recognized as a special field only a little more than twenty-five years ago. Before that time and within the memory of some of us, forty to fifty years ago, operations upon the central nervous system were rare and were performed by the general surgeon. Some of the earliest operations for tumor of the brain were performed in New York City by general surgeons, Drs. Charles McBurney at Roosevelt Hospital, Arpad G. Gerster at The Mount Sinai Hospital, and Andrew J. McCosh at the Presbyterian Hospital. Just fifty years ago, in 1892, Frank Hartley described the operation for the intracranial exposure of the Gasserian ganglion which was known for many years as the Hartley-Krause operation.

It was natural that the neurologist of those days felt that he should supervise any operation on the central nervous system that was performed by the general surgeon. Not quite fifty years ago, in 1893, M. Allen Starr, Professor of Neurology at the College of Physicians and Surgeons, published a volume on the surgery of the brain. You will note the interesting fact that a book on brain surgery was written by a neurologist. In this book, Dr. Starr gave the following quaint advice to the surgeon: "It is an absolute requisite of success in cerebral operations that every detail of aseptic surgery should be carried out to perfection. It is useless to make elaborate preparations, to sterilize instruments and to apply antiseptic solutions to the hands, if in the midst of the operation the surgeon stops for a moment to adjust his septic eyeglass, or to

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blow his nose on a septic handkerchief without subsequently washing his hands again." This was perhaps good advice but Dr. Starr spoiled it all by his next remark: "By covering the hand with a wet aseptic towel, the surgeon can safely handle anything he desires." It is hard to realize that this crude advice was given less than fifty years ago.

Even as recently as seventeen years ago, the neurologist had the point of view expressed, for example, by Dr. Mills of Philadelphia, that one of the functions of the neurologist is to *superintend* and *direct* operative procedures on the brain and spinal cord by the surgeon.* At about the same period, a similar viewpoint was expressed to me in writing by another eminent neurologist: "that the function of the surgeon was to do the technical work and to make the opening in the skull or spine in the area mapped out by the neurologist, and that the surgeon should not attempt to make a diagnosis or to localize the growth." Fortunately, *tempora mutantur et nos mutamur in illis!* Fortunately, also, the neurological surgeon has learned something of neurology so that he is no longer looked upon merely as a technician. Perhaps the change may be appreciated by the evidence that in recent years an increasing number of neurological surgeons have been elected to membership in the American Neurological Association: Twenty-five years ago, in 1917, there were 121 active members in the Association of whom 4 per cent were neurological surgeons; in 1925, the percentage was 5; in 1935, it was 10 and in 1941, it was 15 per cent. This steady increase in the number of neurological surgeons in the American Neurological Association was a cause for perturbation of some of the members. One of them wrote to the Council of the Association and asked how long it would be, at the same rate of increase, before the American Neurological Association would consist mainly of neurological surgeons! When that letter was read at the Council meeting, one of the members calculated that at the same rate, in 1967, more than one-half of the members would be neurological surgeons!

A neurosurgical service can be developed only in a special hospital or in a general hospital in which there are special neurological and neurosurgical beds. A capable operating team cannot be developed in an institution in which a major operation upon the central nervous system is performed only a few times a year. In most of the general hospitals in New York City, until about twenty-five years ago, there

* Semi-Centennial Volume of the American Neurological Association, 1875-1924.

was not a sufficient number of patients with diseases of the nervous system to justify a special neurosurgical service. If the Neurological Institute (which is a special hospital) was excepted, there were at that period active neurosurgical services only at The Mount Sinai Hospital and at Bellevue Hospital in both of which there were special wards for patients suffering from diseases of the nervous system. Recently, departments for the surgical treatment of diseases of the nervous system have been developed at the New York, the Brooklyn Jewish and to some extent in a few smaller hospitals. Also, it is of interest to note that until recently, the title of the neurological surgeon—if he was a member of the faculty of a medical school—was “Professor of Surgery.” Dr. Cushing was professor of general surgery at Harvard and Dr. Frazier was professor of general surgery at the University of Pennsylvania although both limited their work almost exclusively to neurological surgery. However, about 21 years ago, Columbia University at the College of Physicians and Surgeons, established a full chair for neurological surgery with a seat on the faculty of the Medical School.

Neurological surgery has developed, as was logical, as an offshoot from general surgery, and the emergence was due to a process of education of the general surgeon, the neurologist, the physician and the layman. Actually it required only a few decades for the new specialty to be generally recognized. In the beginning, a few general surgeons began to devote themselves to neurology and to operations upon the nervous system. There is, perhaps, a certain disadvantage in what is happening today, i.e., that many young men receive their training in neurosurgery and become neurological surgeons without having had a thorough basic experience in general surgery. While it is true that a neurologist may learn to do his own operating (as was done by the late Ottfried Foerster in Breslau, Germany and by Clovis Vincent in Paris), a groundwork in general surgery is of no little value.

Most of the younger neurological surgeons of our day have received their training in one of the neurosurgical centers in this country. A few of the older ones began to practice in the special field after an experience with injuries of the brain, spinal cord and peripheral nerves in the first World War. While a knowledge of traumatic surgery is of value, more than that is needed for the practice of neurological surgery in civil life. However, we learned much from the experiences gained in the first World War.

For example, in high explosive and bullet wounds of the skull and spine, the method of *débridement*—the excision of lacerated soft and bony tissues—proved to be of great value for the prevention of secondary infection of the brain or spinal cord and their meninges. If the area in which infectious material has been implanted can be excised, the wound may often be closed with resultant primary union. The method of *débridement* was most useful in the treatment of wounds of the extremities and of the peripheral nerves. The conflict that is now raging will no doubt, as in the first World War, produce a large number of bullet and high explosive wounds of the upper and lower limbs. In his very recent report of experiences at Pearl Harbor, Dr. John Moorhead made special reference to the high frequency of wounds of the nerves of the extremities. During the first World War, the method of *débridement* and the use of chlorine solutions (Carrell-Dakin treatment) greatly diminished the frequency of wound infections. However, it may not be amiss to call attention to one danger of *débridement*. Having had occasion to operate upon a large number of soldiers with peripheral nerve injuries after they had been invalided home from the battlefronts, I learned that occasionally evidence of complete interruption of the function of a large nerve followed only after the mass extirpation of lacerated soft tissues. In some of the cases, one was led to suspect that the neural lesion was produced by the surgeon. The functions of a large nerve may be preserved even though the nerve traverses an area that is infected or even an area of actual suppuration. Therefore, especially with the sulfathiazole treatment of wounds, every effort should be made by the surgeon to preserve nerves which have not been injured and those that are only traumatized, especially those nerves, such as the ulnar in the upper and the sciatic and its branches in the lower limbs, in which regeneration after nerve suture is poor.

It is to be hoped that the follow-up of patients in whom nerve transplants have to be used to bridge nerve defects will be better than that after the first World War. After the former conflict, there was not an efficient follow-up, and our knowledge is still meager regarding the final results in these individuals in whom the separated nerve ends could not be united by suture and transplants were used. In these patients, many types of operation were tried but we do not know which methods gave the best results.

Aside from these surgical matters, the neurologist learned much from

the experiences of the former conflict. Thus, the *coup-de-grace* was given to the so-called Bastian-Bruns law regarding the symptoms and signs of complete transverse lesions of the spinal cord. You will remember that for many years the symptoms of a complete transverse lesion of the spinal cord in man were supposed to consist of permanent loss not only of sensation and voluntary motor power below the level of the lesion but also of persisting absence of all tendon and cutaneous reflexes. We now know that after a certain period there is a return of spasticity and of reflexes without, of course, any return of sensation or voluntary power. The experiences of the first World War increased our knowledge of the location of functions in different parts of the brain and spinal cord, of mass reflexes and of automatic activity of the urinary bladder.

When one looks back upon neurological surgery as it was in the early days of the specialty and compares it with the work of today, the differences are great and impressive. At that time we had not learned that the "enacting clause" in operations for tumor of the brain was the diminishing of the increased intracranial pressure. Can you imagine the difficulties of the neurosurgeon before we learned of the value of hypertonic solutions and of the method of puncture and evacuation of fluid from the ventricles and subarachnoid cisterns in order to lessen intracranial tension? In those days the patients were always anesthetized—usually by ether which by itself raises intracranial pressure. We had to learn that these operations could and should be performed under local infiltration anesthesia—a method first recommended for cranial surgery by Dr. DeMartel of Paris. In this country, I believe, the first cranial operations for tumor of the brain under local anesthesia were performed by myself at the Neurological Institute of New York. As you know, local anesthesia is now used for the majority of cranial operations and it is especially effective when the patient has received avertin before he is brought to the operating room.

During the past decades, great advances have been made in the methods of hemostasis: First came silver clips, then the use of muscle, and finally the high frequency current. Many improvements were made in the methods of making bone flaps and in the technique of exposure of tumors on the under surface of the brain; of growths in the cerebellopontine angle and in the cerebral ventricles. The methods of excision of infiltrating tumors of the brain have become more and more

radical so that today no neurosurgeon would hesitate to excise the greater part of one cerebral or cerebellar lobe. It is very questionable, however, whether there is ever any justification for the total or subtotal removal of a cerebral hemisphere.

I have wandered somewhat afield and away from the story of the development of neurological surgery in New York City. During the past 25 years, New York City has had twenty-three surgeons who limited their work to the surgery of the nervous system. With the possible exception of two of these, all of the surgeons have had a training in neurology and neurosurgery, either in one of our local institutions or in a neurosurgical clinic in some other city. It may be of interest that we have had one woman specialist in this field. At the present time there are in the greater city of New York sixteen active neurological surgeons and several younger men who are beginning to devote themselves to the specialty.

During the first part of the 25 year period, there were neurosurgical departments at the Neurological Institute and at Bellevue and The Mount Sinai Hospitals. The service at the Neurological Institute was directed by me, and associated with me were Drs. Alfred S. Taylor, Byron Stookey, James H. Kenyon, Clement Masson, Wilder Penfield, Dorothy Klenke, Leo M. Davidoff, Edwin Deery, Fritz Cramer and Earl D. Brewer. When I retired from the ward service, Dr. Stookey was appointed to take charge, Dr. Davidoff resigned in order to become surgical director of a Brooklyn hospital, Dr. Deery resigned, and Dr. John Scarff was appointed a member of the surgical staff. Previous to this period, Dr. Penfield had resigned in order to become the Director of the Montreal Neurological Institute, Dr. Klenke had resigned and the Neurological Institute had lost Dr. Brewer and Dr. Kenyon through death. In 1938 Dr. Tracy J. Putnam was appointed chief of the neurological and neurosurgical services of the Neurological Institute.

At Bellevue Hospital the neurosurgical service was in charge of Dr. Taylor, and at various times there were associated with him Dr. Stookey and Dr. J. J. King. Later, the work at Bellevue was done by Dr. King, Dr. Scarff and lately by Dr. Lawrence Pool.

Up to 1927, the neurosurgical service at The Mount Sinai Hospital was in my charge and that of Dr. Ira Cohen; upon my resignation, Dr. Cohen became the head of the service with Dr. Kaplan and Dr. Sidney Gross as associates.

Although there was no special neurosurgical department at the Presbyterian Hospital, considerable work was done in that institution by Dr. Penfield and Dr. William Cone before they left for Montreal and the histological and pathological studies made by them in the laboratory for neurocytology organized by Dr. Penfield deserves special mention. At the Brooklyn Jewish Hospital, Dr. Davidoff a few years ago organized a neurosurgical service, and he has been doing a large amount of operative work in that institution. In Brooklyn, considerable neurosurgery has also been done in several hospitals by Dr. Jefferson Browder, and some by Dr. Anatole Kolodny.

Recently, an efficient department for the operative treatment of diseases of the nervous system is being developed by Dr. Bronson Ray at New York Hospital, and during the past two decades some operations on the nervous system have been done in other hospitals by neurosurgeons at St. Luke's Hospital and at the Post-Graduate and the Polyclinic Hospitals and a few other institutions.

A certain number of operations for fractures of the skull and the spine were and are still being performed by general surgeons at various hospitals in our City, but the general tendency has been—whenever and wherever possible—for fractures of the skull and the vertebral column to be cared for by the neurological surgeon.

During the early years of the 25 year period, abscess of the brain complicating middle ear disease was cared for and operated on by the otologist. As the field of neurological surgery became more specialized, these patients were more often referred to the neurosurgeon and today most of these operations are performed by the surgeon who specializes in this field.

Finally, I may be permitted to give a short account of some of the contributions to neurology and neurosurgery made by the special workers in the latter field in our city:

A number of years ago, Dr. Alfred S. Taylor, who by the irony of fate recently succumbed to an infiltrating tumor of the brain, developed the technique of operations for birth injuries of the brachial plexus, and he also described the operation of unilateral laminectomy and devised ingenious instruments for that operation. Much of Dr. Taylor's work was done at Bellevue Hospital and at the Neurological Institute. Also, on the special service at Bellevue Hospital, Dr. J. J. King did important work on the methods of operation for abscess of the brain.

I have already referred to the valuable studies on the glia by means of the newer staining methods that were made by Dr. Penfield and Dr. Cone.

I think that it is fair to state that to the development of the surgery of the spinal cord, New York surgeons made important contributions. The technique of the operation of laminectomy was developed by them, and they added much to our knowledge of the clinical features and the diagnosis of tumors and other lesions of the spinal cord and its membranes. The clinical symptoms and surgical treatment of the so-called giant tumors of the conus and cauda equina—which are most often ependymomas—were first described by neurosurgeons of our city and the same is true of varicosities of the spinal blood vessels and of extradural cysts of the spinal cord.

The improvements in the methods for performing manometric tests for the determination of the presence or absence of spinal subarachnoid block were no insignificant contribution. The refinements in the methods for testing the patency of the spinal subarachnoid space were made by Dr. Stookey and his collaborators. To neurosurgeons of our city also belongs the credit for having devised the method for the exposure of the anterior surface of the spinal cord in order to remove tumors from in front of the spinal cord and to treat other lesions in that situation.

It was formerly believed that the malignant tumor of the brain, which is now called glioblastoma multiforme,* occurred most often in the frontal parts of the cerebral hemispheres and especially often on the left side. The study of a large number of cases at operation and postmortem convinced us that the growth is most frequently situated in the parietal lobe although it often extends forward to involve the frontal lobe and more especially the inferior part of the temporal and frontal lobe of the brain. With another investigator, one of us called attention to the fact that glioblastoma multiforme of the brain frequently runs a very rapid course—a course quite different from that of most cerebral growths. The history of the patient's illness may be of only one or a few weeks duration and the symptoms run an acute course.

Profound disturbances in motor power and sensation and advanced mental deterioration often come on very rapidly. For this reason, we

* For reasons that have been frequently expressed in print, I still believe that the term "spongioblastoma multiforme," originally given to the growth by Globus and Strauss, is preferable.

TABLE I
RESULTS OF OPERATIONS IN 83 PATIENTS WITH GLIOBLASTOMA
MULTIFORME OF THE BRAIN

Death within 4 weeks	44	53 per cent	} 84 per cent
" " 4 months	10	12 per cent	
" " 1 year	16	19 per cent	
" " 1-2 years or more	9	11 per cent	
Living 4 months after operation	1		
" 8 " " "	1		
" 10 " " "	1		
" 22 " " "	1		

suggested that these growths might be called "acute" brain tumors. I think that there is some doubt whether the glioblastoma multiforme is a true neoplasm or whether it is a tumor formation resulting from an intense glial reaction to some noxious agent. If this point of view should be shown to be correct, then it is clear that in the future the proper treatment of this type of tumor will rarely be surgical. The results of the operative treatment of glioblastoma multiforme are poor and relatively few patients survive for more than one year. This is shown, for example, by the results in the series of cases presented in Table I—results which about correspond to those obtained in other neurosurgical clinics.

Another type of tumor which we have studied is the midline posterior fossa medulloblastoma which occurs so often in childhood. Many attempts have been made radically to extirpate these growths, but they can rarely if ever be entirely removed because of their vascular attachment in the lower part of the fourth ventricle. This type of tumor is very radiosensitive, and we have shown that as good if not better results can be obtained if the effort is not made to remove the growth. In most instances, by a wide suboccipital decompression with removal of only sufficient tumor tissue for pathological verification, followed by thorough Roentgen-ray therapy, as much will be accomplished and relief will last as long as after the attempt to remove the growth entirely. Moreover, if one takes into account the higher operative mortality of an attempted radical operation, the total results of the operative treatment of the medulloblastoma in the posterior cranial fossa are better with conservative surgery and radical Roentgen therapy.

The early diagnosis of benign tumors underneath the frontal lobes of the brain—more especially the olfactory groove, cribriform plate and

sphenoid ridge meningioma—is important for their surgical treatment. When these growths have reached a large size, the difficulties and dangers of their removal are much increased, and in some instances the large growths can not be entirely removed. We, in New York City, have been greatly helped by a New York roentgenologist, Dr. Cornelius G. Dyke, and his studies of the basal arachnoid cisterns after the injection of air or oxygen by the lumbar route. With a neurological surgeon Dr. Dyke was able to demonstrate that many subfrontal meningiomas, especially those which originate from the dura over the mesial end of the sphenoid ridge, can be recognized and be removed when they are still small—weighing only a few grams.

That the diagnosis of some tumors of the spinal cord can be made by careful measurements, on Roentgen films of the spine, of the distances between the pedicles, was demonstrated by the same roentgenologist with a New York neurosurgeon. Studies of a large number of Roentgen films of the spine were correlated with the operative findings and we learned that certain spinal growths regularly produce a localized enlargement of the spinal canal which can be recognized when the interpediculate distances are carefully measured. By these measurements it was possible to demonstrate that the spinal meningiomas rarely, and the spinal perineurial fibroblastomas frequently, cause localized enlargements of the interpediculate distances. An enlargement of the vertebral canal extending over several vertebrae is characteristic of the extradural cysts and of the so-called giant tumors of the conus and cauda equina.

The clinical picture of high cervical spinal cord tumors which project through the foramen magnum was first described by a New York surgeon and a neurologist. Attention was called to the fact that in operations for these growths it is always necessary and advisable partly to expose the structures in the posterior cranial fossa by the removal of some of the occipital bone. If this is not done, a part of the growth above the level of the foramen magnum may be missed altogether—an unfortunate occurrence which happened in our first case and which taught us a valuable lesson.

Finally, one may ask: what of the future? That old Roman, Cicero, said that “in no function do human beings approximate the Gods more closely than in bestowing health upon their fellowmen.” We must change methods or improve them as soon as we learn that we are using a procedure by which little or nothing is being accomplished. There

are some diseases of the nervous system for which surgery has been able to do little or only to palliate, and for these, new surgical methods must be sought for or the treatment must not be surgical. Thus, it is probable that when the diagnosis can be made—and it can be made in many instances—fewer operations will be done in the future for the malignant glioblastoma multiforme. Future therapy may be radiological or perhaps serological. In purulent infection of the meninges the therapy of the future may not be surgical. The isolation and synthesis of many of the vitamins by the biochemists have opened up a large field for clinical investigation and “these discoveries of the biochemists, if applied to the prevention and treatment of diseases of the nervous system, may be compared in importance to the discoveries in bacteriology made 40 to 50 years ago.” Is it too optimistic to expect that some diseases of the nervous system which produce great disability, such as spasticity and tonic and clonic seizures, and for which surgical procedures are being attempted, will in the future be prevented or treated by medical means? This does not mean that neurological surgery will not continue to advance. We can not expect that the progress in operative methods and technique in the next twenty-five years will be as great as that made in the same period that has passed. The further progress of neurological surgery will be more slow, but new procedures and greater refinements of technique are certain to come.